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Tours de Main

We prefer this French expression to its English equivalent, " Tricks of the Trade," as the latter implies something underhand. We esteem *tours de main* as having made contributions to foundry practice of equal, if not greater, measure than those so far contributed by scientific research. Whoever first utilised a draw-back, a riser, or a split pattern indeed made a great contribution to foundry practice. The use of heated moulds was not the result of research, though instrumentation is now available to reveal the scientific implications of the system. The use of pencil runners is another development which had purely an experimental background rather than a research basis, yet a valuable contribution was made to foundry technique. Either Longden or Léonard was first responsible for disclosing the deleterious effect of having protruberances of sand jutting out into a mould. The significance of " hot-spots " has recently been put to good use by Williams in the genesis of his system of feeding, wherein the effect of atmospheric pressure is used to better advantage. Again, it was probably the germ of the new idea of feeding castings by the use of exothermic material incorporated in refractories around runners and risers.

The great heritage of *tours de main* includes such items as stack moulding, stripping plates and the use of linseed oil as a core binder. The last cited was said to be a Belgian idea which was brought to this country by the late Mr. C. Moorehead and used in the works of Williams & Robinson, of Thames Ditton, and later Rugby. This development made possible the mass production of motor-cars and has conferred incalculable benefits to what people designate " progress." Centrifugal casting, moulding machines, and Sandslingers enter the category of inventions, and though they have had a revolutionary impact on the foundry industry, their ultimate success was often due to the reinforcement of the basic principles by a series of *tours de main*, which aggregated are now known as the " know how."

A quite new *tour de main* has recently come to light in connection with a foundry query we published some weeks ago. This related to the casting of a hollow cylinder wherein difficulty was envisaged with the venting. Amongst the many replies sent in (which will form the subject of an article in the near future) was one from Mr. J. F. H. G. Goffart, the foundry manager at Cockerill of Belgium. He suggested that the casting should be cast on end and that the perforated core barrel should protrude through the core print. The upper aperture of the barrel was then to be subjected to a cross-blast from a compressed-air nozzle during the freezing period. This would obviously enhance the normal chimney effect very materially and thereby bring about the much better evacuation of the gases from the core. Here, then, is disclosed a system capable of application to many types of troublesome problems.

There is a real need for these various important *tours de main* to be placed on a truly technical if not scientific basis. The various shops are wasting metal by using running and risering methods which are antiquated, though experience has shown them to be effective, because there exists no technology which postulates more precisely exact sizes as related to section thickness, weight and type of metal used. In these days of fuel and material shortages, it is imperative that all these *tours de main* should be developed technically, as they all, if they are worthy of the name, result in the production of better castings at lowered costs.

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National Brassfounding Association Jubilee Banquet

The 50th anniversary of the inception of the National Brassfounding Association was celebrated last Saturday at a dinner held at the Grand Hotel, Birmingham; Mr. R. D. Best presiding. Supporting him at the high table were the Lord Mayor of Birmingham (Alderman Bradbeer); the Rt. Honourable Oliver Lyttelton, M.P.; Lord Beveridge; Sir Frederick Bain; Mr. G. Heaton Nicholls (High Commissioner for South Africa); Sir Percy Mills; Sir Patrick Hannon, M.P., and Professor P. Sargant Florence.

Mr. Nicholls, in his speech, made a strong plea for Empire co-operation, especially in view of the vulnerability of the United Kingdom under modern conditions of warfare. He suggested mass emigration to the Dominions as a safeguard. Professor P. Sargant Florence said the building up of the brassfounding industry owed everything to human enterprise and nothing to natural circumstances. He thought there should be more discussion in industry about standardisation, design, and export markets.

The Lord Mayor strongly criticised government from Whitehall; he insisted that the strength of democracy rested in the great provincial cities.

Sir Frederick Bain, replying to a toast proposed by Lord Beveridge, said that whilst industrialists accepted that there must be cuts in capital expenditure, there must be corresponding cuts in Government national expenditure. It would be a test of the Government's capacity to govern if it was prepared to face the unpopularity of such cuts.

Mr. Oliver Lyttelton, M.P., criticised the compulsory direction of labour. Those directed to mines, foundries and the like would possibly spread unrest and slackness. He thought the export targets would not be achieved because of price levels or market disinclination to accept the goods.

Mr. R. D. Best said industrialists were being asked to shoulder heavy responsibilities and, in many cases, to risk capital to carry out plans on which consultation had been sketchy or non-existent.

Let them make it their task to break down those iron curtains of the mind which prevented groups of people from exchanging ideas, so that all might participate in the fun and excitement of getting the country out of the awful mess.

A tremendous reservoir of goodwill and energy among the employer class was at present dammed by spurious theories regarding the behaviour of classes.

MR. A. H. STURDEE, M.I.Mech.E., of the Birmingham Aluminium Castings Company, Limited, and chairman of the Light Metal Founders' Association, has, on the occasion of his retirement, been presented with a massive silver salver carrying the signatures of his colleagues.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

OCTOBER 6.

Institution of Production Engineers.

Yorkshire Section :—" Noise and Vibration in Machinery," by W. A. Tuplin, D.Sc., at the Hotel Metropole, Leeds, at 7 p.m.

OCTOBER 9.

Institute of Metals.

London Local Section :—" The Hardening of Non-ferrous Alloys and Steels by E. H. Bucknall, M.Sc., F.I.M., at No. 4, Grosvenor Gardens, London, S.W.1, at 7 p.m.

Scottish Engineering Students' Association.

Presidential Address by Sir James Lithgow, Bt., G.B.E., M.C., at 7.30 p.m., in the Institution of Engineers and Shipbuilders, Glasgow.

Institution of Electrical Engineers.

Inaugural Address by Mr. P. Good, C.B.E., President, at 5.30 p.m., in the Lecture Theatre of the Institution, Savoy Place, London, W.C.2.

OCTOBER 10.

Manchester Association of Engineers.

Inaugural Address by the President, F. H. Williamson, B.Sc.Tech., at the Engineers' Club, 17, Albert Square, Manchester, at 6.45 p.m., followed by a smoking concert.

Keighley Association of Engineers.

" Precision Castings for General Engineering Purposes," by F. Hudson, F.I.M., at Devonshire Buildings, Keighley.

Institution of Production Engineers.

Coventry Section :—" The American Attitude to Production Modernisation," by H. H. Beeny, at Coventry Technical College, at 6.45 p.m.

Institute of British Foundrymen.

OCTOBER 6.

Sheffield Branch :—" Economic Aspects of the Foundry Industry," by the President, Mr. B. Gray, at the Royal Victoria Hotel, Sheffield, at 7.30 p.m., followed by a smoking concert.

OCTOBER 7.

London Branch—Slough Section :—Works visit to Hayward Tyler & Company, Limited, Luton.

OCTOBER 8.

London Branch—East Anglian Section :—" Cupola Operation, Precept, and Practice," by C. A. Payne, B.Sc., at the Lecture Hall, Central Library, Ipswich, at 7 p.m.

OCTOBER 11.

Newcastle Branch, Middlesbrough Branch :—Joint visit to Messrs. Doxford & Sons, Limited, Sunderland. Meet at 10 a.m.

West Riding of Yorkshire Branch :—Presidential Address by D. W. Hammond, followed by " The Lost Wax Process," by F. Hudson. At the Technical College, Bradford, at 6.30 p.m.

Machine Tool and Engineering Exhibition, London, 1948

The 1948 Exhibition will open at Olympia on August 26, 1948, and close on September 11, 1948. It will be the largest show of machine tools, woodworking machine equipment and accessories ever staged in Great Britain. The three halls at Olympia have been taken and there will be nearly a quarter of a million square feet of space available. The Exhibition will be international in scope; foreign exhibits will be shown side by side with British equipment and users will be able to compare the respective merits and observe the developments that have taken place.

The Annealability of White Iron in the Manufacture of Malleable Iron*

By S. W. Palmer, A.R.I.C., A.I.M.†

Malleable cast iron has long been established as an important engineering material, suitable for numerous applications requiring a measure of shock-resistance and ductility. Malleable iron castings cover a wide range of applications in the automobile, agricultural and general engineering industries, as well as in the manufacture of domestic and general utility appliances. There is every indication that these demands, enlarged by the many other potential uses to which malleable iron can be efficiently applied, will persist in similar magnitude for a long time to come, and will be accompanied by an ever-increasing demand from engineers and designers for higher and more detailed mechanical and physical properties.

Since the establishment of the existing specifications for blackheart and whiteheart malleable iron, namely, B.S.S. 309 and 310, the mechanical properties of these materials have improved considerably beyond the minimum requirements of these specifications. Revised specifications for malleable cast iron now being considered should indicate to the user and engineer the extent of the progress which has been made.

With the likely advent of new specifications, together with demands by designers for better and still better malleable iron, it is clear that all manufacturers who wish to produce top grade material, and to go on producing that material with consistency, must be provided with more fundamental knowledge of the factors influencing the quality of their products. The application of this knowledge will involve improved control of melting and pouring procedures, improved control of metal composition, and improved control of the annealing process. The optimum mechanical properties and uniformity of product will only be achieved when each of these factors receives its due consideration in the light of the knowledge obtained as the result of research activity.

Several important Papers have been presented to this Institute within the last two or three years, on a subject which is very much to the fore at the present time, as far as the manufacture of whiteheart malleable iron is concerned. This subject is the annealing of whiteheart malleable iron castings to obtain the necessary decarburisation, in a controlled gaseous atmosphere without the need for packing the castings in annealing ore. This work has undoubtedly marked a considerable advance in the whiteheart industry, as far as the means of removing the carbon from the surface of the casting is concerned. The authors of these Papers admit, however, that the factors limiting the rate of decarburisation, and also the length of the annealing process, are the rate of diffusion of carbon through iron, and the rate of graphitisation. The rate of diffusion of carbon and the rate of graphitisation during the annealing of whiteheart malleable castings are, for a given section size and temperature, a function of metal composition, linked with possible preheating and/or pre-quenching treatment. To these one may add the pouring temperatures employed, and the conveniently named "inherent characteristics" of the raw materials.

In general terms it can be said that the study of the annealability of a white iron casting, to be annealed in the whiteheart process, involves consideration of the length of time required at the holding temperature in order to decompose all its eutectic cementite, and the rate of carbon diffusion outwards to its surfaces. The shorter the required holding period, and the more rapid the rate of carbon diffusion, then the more annealable is the material. The annealability of a blackheart malleable iron casting is indicated by the length of time required at the upper holding temperature to decompose all eutectic cementite, together with the duration and temperature of the secondary graphitising treatment required to produce a metallographic structure of temper carbon in a completely ferritic matrix. Similarly, the shorter the required upper holding period and the

FIG. 1.—SPHERULITIC TEMPER CARBON NODULE IN WHITEHEART MALLEABLE IRON. × 350.

*Presented at the Nottingham Conference of the Institute of British Foundrymen.

†British Cast Iron Research Association.

Annealability of White Iron

shorter the secondary graphitising period required to produce a completely ferritic matrix, then the more annealable is the material.

It is the purpose of this Paper to give some indication of the work that has been carried out and is still being continued in order to further existing knowledge of the annealability of white irons used in the manufacture of malleable iron. It will be appreciated that this is not a detailed account of work completed, nor does the Paper attempt to refer to all the researches upon malleable iron which are proceeding at the laboratories of the British Cast Iron Research Association. However, it is thought that the following brief account will serve to indicate the general trends of the results obtained on some aspects of the work.

SECTION I

The Annealability of Whiteheart Malleable Iron

The effect of carbon and silicon upon the castability and annealability of whiteheart malleable iron is reasonably well known, and it is generally agreed that the phosphorus content should not exceed 0.1 per cent. if inferior ductility is to be avoided. Much information concerning the effect of residual elements in whiteheart malleable is also available in a report[1] presented to the Institute during the last Annual Conference. There is, however, a large field for investigation in respect of the manganese and sulphur contents in whiteheart malleable iron. In this section of the malleable iron industry, the manganese and sulphur contents used vary considerably; a large number of manufacturers produce material having manganese contents ranging between 0.15 and 0.25 per cent., in conjunction with relatively high sulphur contents ranging between 0.15 and 0.3 per cent. This type of material normally contains free iron sulphide, associated with manganese sulphide, in the microstructure, indicating that there is less manganese present than is required to ensure that all the sulphur is in the form of manganese sulphide. In this material the temper carbon resulting from the annealing treatment is in the form of compact, often spherulitic, nodules.

A perhaps smaller number of manufacturers produce a good quality whiteheart malleable iron from a material having manganese contents ranging between 0.3 and 0.5 per cent., in conjunction with relatively low sulphur contents of not greater than 0.2 per cent.

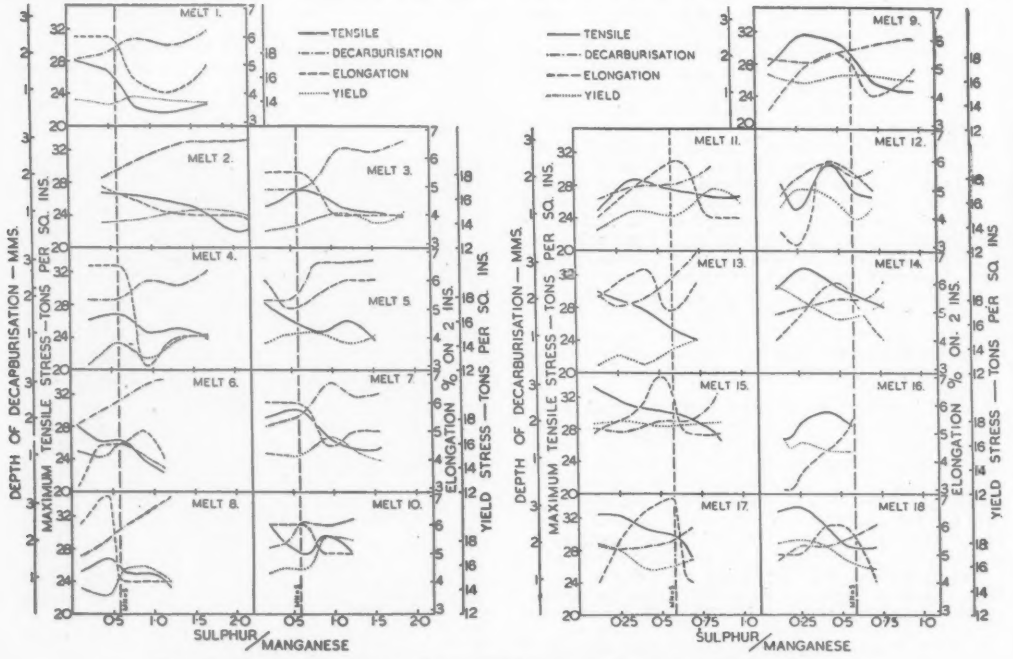

FIG. 2.—RELATION BETWEEN SULPHUR-MANGANESE RATIO AND TENSILE STRENGTH.

In this material the greater part, if not all, of the sulphur content is in direct chemical combination with manganese, in the form of manganese sulphide, indicating that the sulphur content is more or less neutralised by the manganese content. The temper carbon which results from the annealing of this material is usually in the form of clusters or aggregates of small flakes or ragged particles of graphite. It would appear that the mechanism of graphitisation in the two types of iron may be different.

In the preceding paragraphs reference has been made to two different forms of temper carbon, which may result from the decomposition of cementite. These two forms have been referred to as the "spherulitic" variety and the "flake-aggregate" type.[2] Since in what follows frequent reference will be made to these two types, it is not inappropriate here to define and illustrate the differences involved. The spherulitic variety tends to occur when free iron sulphide is present in the microstructure and, as seen at high magnifications, is characterised by a compact spheroidal mass of graphite with graphite crystallites apparently radiating from a central nucleus. A typical example is shown at high magnification in Fig. 1, and further examples at low magnification are seen in Figs. 6 and 7. The term "spherulitic" is well known in mineralogy, and is used to describe this type of radial structure. The flake-aggregate variety tends to occur when the sulphur is predominantly in the form of manganese sulphide, and is characterised by an apparently random grouping of graphite crystals which individually resemble small flakes of graphite. Typical examples are shown in Figs. 3, 8, 9, 10, 14, 15 and 16 of this Paper. The apparent compactness of the flake-aggregate nodules varies considerably, ranging from a wide dispersion (Figs. 8 and 9) to a fairly compact structure (Figs. 11, 12 and 17), which nevertheless is not of the spherulitic pattern.

An excess of sulphur with respect to the manganese content, the sulphur being a carbide stabiliser, helps to prevent the formation of mottle in the heavier sections of a casting, and by suppressing graphitisation, promotes more efficient decarburisation. From the foregoing it can be readily appreciated that the effect of manganese and sulphur is fundamental to the malleablising process, particularly in respect of rates of decarburisation and graphitisation. The ideal rates of heating and cooling during annealing vary according to the manganese and sulphur contents, as well as silicon content and until the precise influence of variations of the manganese/sulphur ratio are understood, the production of good quality whiteheart malleable iron will remain a rule-of-thumb process.

It is useful at this stage briefly to present the facts which are known about the occurrence of sulphur and manganese in cast irons, their inter-relationships, and to point out the bearing which this knowledge has upon the annealing process for malleable iron. In the absence of manganese, sulphur in cast irons occurs in the form of iron sulphide (FeS). Manganese, however, has a greater affinity for sulphur than iron, and when present, as it usually is, it tends to combine with the sulphur according to the following reaction:

$$FeS + Mn \rightleftharpoons MnS + Fe$$

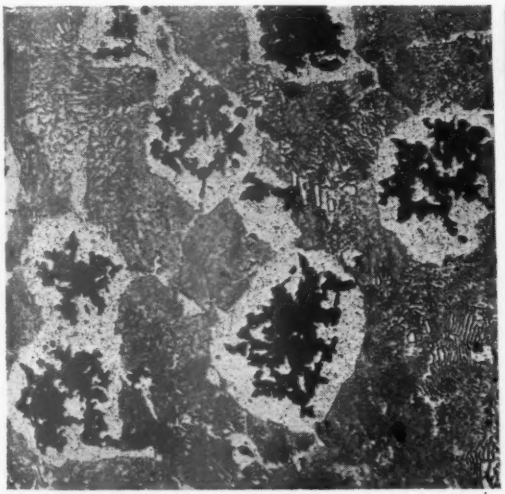

FIG. 3.—BAR NO. 2A. MANGANESE 0.13 PER CENT.; SULPHUR 0.052 PER CENT.

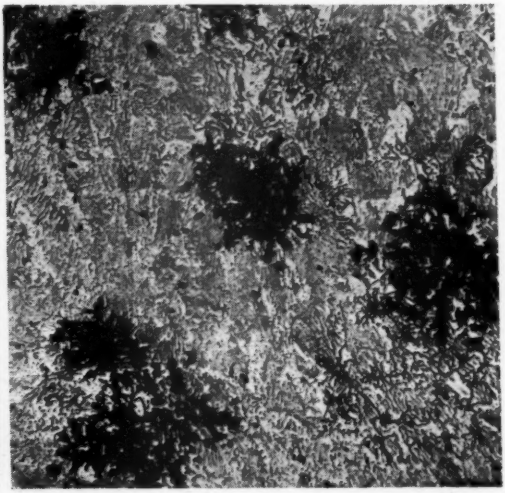

FIG. 4.—BAR NO. 2B. MANGANESE 0.13 PER CENT.; SULPHUR 0.110 PER CENT.

MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

Annealability of White Iron

TABLE I.—*Chemical Compositions and Mechanical Properties of Experimental Bars.*

Melt No.	Tap.	T.C. Per cent.	Si. Per cent.	Mn. Per cent.	S. Per cent.	P. Per cent.	Yield Stress. Tons per sq. in.	Max. Tens. Stress. Tons per sq. in.	Elongation. Per cent. on 2 ins.	Bend Value. Deg.	$\frac{S.}{Mn.}$
1	A	3.30	0.36	0.13	0.020	0.038	14.1	28.1	6	30	0.10
	B			0.19	0.091		13.7	26.9	6	28	0.48
	C			0.19	0.159		14.4	22.3	4.5	31	0.83
	D			0.20	0.223		14.1	21.6	4	28	1.20
	E	3.35	0.33	0.19	0.324	0.036	13.9	22.6	5	43	1.70
2	A	3.03	0.60	0.14	0.052	0.047	14.1	26.8	5	40	0.40
	B			0.14	0.110		14.3	26.4	4.5	36	0.85
	C			0.14	0.193		15.1	24.6	4	43	1.50
	D			0.13	0.265		14.9	22.0	4	34	2.04
	E	3.29	0.54	0.12	0.320	0.049	14.2	23.7	3	50	2.44
3	A	3.39	0.56	0.15	0.030	0.027	13.4	25.1	5.5	22	0.20
	B			0.15	0.093		13.9	27.4	5.5	32	0.62
	C			0.15	0.166		14.8	25.1	4	31	1.11
	D			0.15	0.232		14.0	24.4	4	24	1.54
	E	3.23	0.61	0.15	0.284	0.026	14.9	23.8	4	34	1.89
4	A	3.28	0.80	0.23	0.035	0.036	12.4	26.1	6.5	25	0.21
	B			0.17	0.097		14.2	26.8	6.5	31	0.57
	C			0.17	0.157		12.9	24.7	3	35	0.92
	D			0.17	0.227		14.6	25.1	4	24	1.34
	E	3.23	0.82	0.15	0.283	0.031	14.9	23.8	4	27	1.67
5	A	2.86	0.41	0.21	0.033	0.039	14.2	28.3	6	36	0.16
	B			0.21	0.099		14.8	26.3	5	38	0.47
	C			0.21	0.170		15.1	24.7	5.5	55	0.81
	D			0.21	0.246		14.2	26.1	6	76	1.17
	E	2.90	0.41	0.20	0.320	0.039	14.8	23.7	6	>180	1.53
6	A	3.05	0.43	0.23	0.019	0.023	15.3	28.1	3	19	0.08
	B			0.23	0.080		14.8	26.0	4.5	20	0.35
	C			0.23	0.136		15.8	26.2	4.5	15	0.59
	D			0.24	0.198		14.9	23.9		30	0.86
	E	3.15	0.36	0.23	0.259	0.022	13.9	22.2	4	61	1.12
7	A	2.97	0.62	0.20	0.030	0.026	15.2	29.1	6	28	0.16
	B			0.18	0.104		14.9	30.2	6	32	0.55
	C			0.21	0.181		16.5	26.7	4.5	42	0.95
	D			0.18	0.247		15.2	25.2	5	47	1.30
	E	2.95	0.61	0.18	0.302	0.027	14.6	25.6	5	41	1.58
8	A	3.29	0.75	0.24	0.025	0.036	14.1	25.2	6	20	0.10
	B			0.26	0.105		13.5	26.8	7	20	0.42
	C			0.24	0.153		15.7	25.3	4	22	0.61
	D			0.25	0.218		15.9	25.3	4	10	0.87
	E	3.22	0.72	0.24	0.298	0.036	14.7	23.3	4	22	1.19
9	A	3.08	0.45	0.34	0.028	0.025	16.5	27.8	3.5	15	0.09
	B			0.31	0.094		15.8	31.7	5	26	0.30
	C			0.31	0.155		16.4	30.7	5.5	21	0.50
	D			0.31	0.223		16.4	25.9	4	25	0.72
	E	3.03	0.42	0.30	0.300	0.023	16.0	24.6	5	20	0.97
10	A	3.13	0.75	0.30	0.055	0.042	15.4	31.0	6	12	0.19
	B			0.28	0.111		15.8	28.9	6	21	0.38
	C			0.28	0.186		15.7	27.3	6	22	0.64
	D			0.30	0.254		18.2	29.6	5	15	0.88
	E	3.10	0.78	0.30	0.353	0.042	18.1	27.3	5	21	1.22
11	A	3.38	0.68	0.37	0.049	0.026	13.7	24.9	4	19	0.14
	B			0.31	0.118		15.2	28.7	5	30	0.35
	C			0.31	0.206		14.8	27.3	6	19	0.61
	D			0.34	0.282		17.0	26.5	4	29	0.83
	E	3.11	0.62	0.36	0.340	0.022	15.9	26.6	4	32	1.00
12	A	3.15	0.31	0.40	0.048	0.025	15.6	28.2	3.5	25	0.15
	B			0.36	0.093		16.9	24.9	3	24	0.24
	C			0.36	0.168		16.5	30.6	6	31	0.44
	D			0.36	0.231		14.6	27.0	5.5	34	0.61
	E	3.06	0.32	0.40	0.300	0.021	15.5	26.6	5	33	0.71

TABLE I.—*Chemical Compositions and Mechanical Properties of Experimental Bars.*—Continued.

Melt No.	Tap.	T C. Per cent.	Si. Per cent.	Mn. Per cent.	S. Per cent.	P. Per cent.	Yield Stress. Tons per sq. in.	Max. Tens. Stress. Tons per sq. in.	Elongation. Per cent. on 2 ins.	Bend Value. Deg.	S./Mn.
13	A	3.12	0.40	0.41	0.054	0.033	12.6	30.0	5.5	29	0.13
	B			0·46	0.108		13.4	28.9	6	31	0.25
	C			0·44	0.177		12.6	27.7	6.5	45	0.41
	D			0·42	0.241		13.8	25.5	5	47	0.56
	E	3·10	0·40	0·42	0.313	0·035	14.7	24.0	6	43	0.73
14	A	3.08	0·37	0·39	0.047	0·027	19.2	30.4	4	13	0.12
	B			0·40	0.110		17.7	32.8	5	26	0.29
	C			0.39	0.181		16.4	30.7	6	27	0.48
	D			0.36	0.248		16.7	2.3	5	20	0.63
	E	3.04	0·65	0.36	0.291	0.030	17.7	28.1	6	35	0 77
15	A	3.04	0·73	0.39	0.038	0.042	17 7	33.4	5	16	0.10
	B			0·36	0.106		18.0	31.2	5.5	25	0.28
	C			0.39	0.166		17.5	30.4	7	23	0.49
	D			0.39	0.249		17.7	29.7	5	23	0.66
	E	2.97	0.69	0.38	0.332	0.037	17.9	26.5	5	28	0.87
16	A	3.33	0.44	0.51	0.071	0.021	16.6	26.8	3	9	0.15
	B			0.49	0.092		15.8	27.0	3	18	0.19
	C			0.52	0.125		16.3	28.7	3.5	16	0.25
	D			0.47	0.215		15.6	30.2	4.5	27	0.44
	E	3.08	0.35	0.49	0.280	0.023	15.6	28.4	5.5	20	0.57
17	A	3.08	0.63	0.48	0.052	0.030	17.8	32.5	4	23	0.12
	B			0.45	0.111		17.3	32.3	5.5	23	0.25
	C			0.45	0.181		15.7	30.6	6.5	23	0.40
	D			0.43	0.254		16.0	29.8	7	26	0.56
	E	3.08	0.62	0.45	0.310	0.031	16.6	27.1	4	18	0.69
18	A	3.09	0.82	0.50	0.053	0.039	17.9	32.8	5	14	0.11
	B			0.49	0.120		18.3	33.4	5	23	0.24
	C			0.49	0.187		17.8	31.3	6	18	0.38
	D			0.48	0.255		16.6	28.7	6	15	0.52
	E	3.08	0.81	0.43	0.346	0.037	15.8	28.5	4	20	0.71

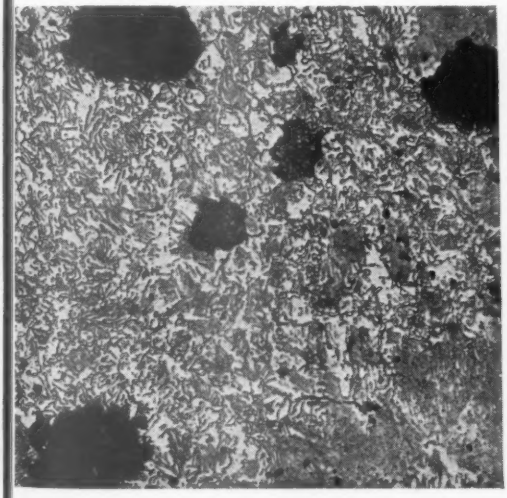

FIG. 5.—BAR NO. 2C. MANGANESE 0.13 PER CENT.; SULPHUR 0.193 PER CENT.

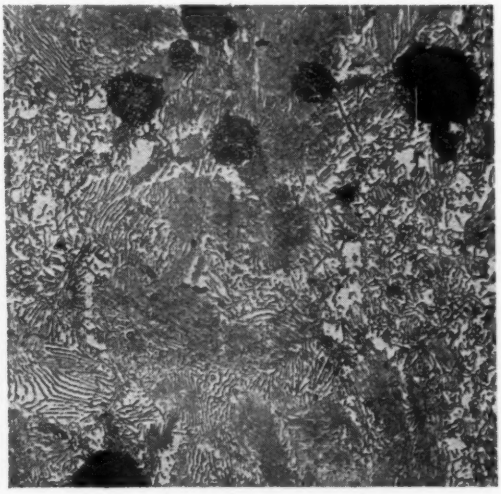

FIG. 6.—BAR NO. 2D. MANGANESE 0.13 PER CENT.; SULPHUR 0.265 PER CENT.

MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

Annealability of White Iron

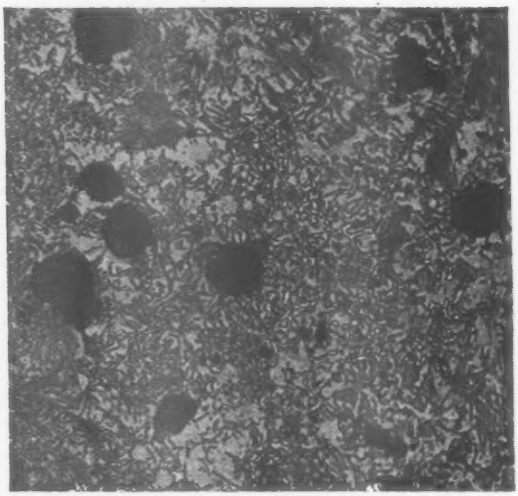

FIG. 7.—BAR NO. 2E. MANGANESE 0.13 PER CENT.; SULPHUR 0.32 PER CENT. MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

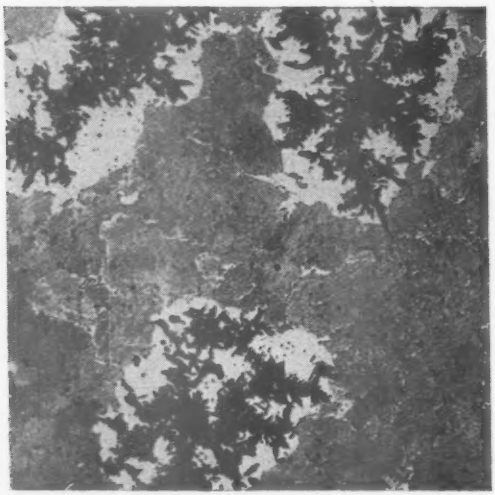

FIG. 8.—BAR NO. 11A. MANGANESE 0.34 PER CENT.; SULPHUR 0.049 PER CENT. MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

This reaction is reversible[3] and tends to proceed to the left at higher temperatures and to the right at lower temperatures. Furthermore, on account of the reversibility of the reaction, an excess of manganese, over that apparently necessary according to their chemical equivalents, is required to ensure that the sulphur exists in the iron as manganese sulphide, MnS. This has led to the development of the empirical formula: $\%Mn = 1.7 \times \%S + 0.3$* to indicate the amount of manganese required to combine all the sulphur as manganese sulphide, MnS. Sulphur in excess, as indicated by the presence of iron sulphide, exerts a powerful carbide stabilising influence. However, when combined completely with manganese to form manganese sulphide, this carbide stabilising influence of the sulphur is neutralised. In what follows it will be shown that the empirical formula given above is not entirely applicable to considerations of the influence of manganese and sulphur on the annealability of whiteheart malleable cast iron, and that a critical condition is reached when the manganese content is equal to the sulphur content in terms of their chemical equivalents, *i.e.*, when

$$Mn\ \% = 1.72 \times S\ \%, \text{ or } 0.58 \times Mn\ \% = S\ \%$$

Investigational work has therefore been planned and is still being carried out in order to obtain a clearer understanding of the influence of the manganese/sulphur ratio and silicon content upon decarburisation, graphitisation, general microstructure, and mechanial properites of whiteheart malleable iron. Attention is also being paid to the influence of different rates of heating and cooling during annealing. An outline of the chemical compositions being studied, the annealing, and the results obtained to date from this work is given in the following.

Preparation of Test Bars and Range of Chemical Compositions Being Studied

A typical whiteheart composition formed the basic composition in this investigation, with the total carbon content of the order of 3.0 to 3.2 per cent., and the phosphorus content limited to a maximum of 0.05 per cent. In order to maintain a close control on metal composition, and to supply a suitable number of test bars, it was decided to carry out all melting in an oil-fired crucible furnace of 250 lbs. capacity. Each melt, using a 250 lb. charge and containing a fixed level of manganese, was divided into five taps of 50 lb. each. Sulphur additions, in the form of iron pyrites (FeS_2) were made to the furnace in order to obtain the following increments in sulphur content:—Tap A, 0.03; Tap B, 0.10; Tap C, 0.17; Tap D, 0.24; and Tap E, 0.31 per cent. From each tap of metal a number of 0.875 in. diameter bars, 0.564 in. diameter tensile bars and $\frac{1}{4}$ in. bend bars were cast with pouring temperatures within the range of 1,400 to 1,430 deg. C.

The 250 lb. charge of each melt, of which there were eighteen, comprised a blending of hematite and refined

* This formula was originally developed by Norbury[4] to indicate the influence of manganese and sulphur upon the tendency to chill of grey cast iron. This formula has been widely adopted and subsequent experience has confirmed its validity for cast iron.

pig irons, suitably balanced with steel. The chemical compositions obtained from these melts, arranged in order of increasing manganese and silicon contents, are given in Table 1.

Annealing of Test-bars and Subsequent Examination

Each of the five taps of all eighteen melts contributed one 0.875 in. diameter bar, two 0.564 in. diameter tensile bars and one ½ in. bend bar. The annealing was carried out in an electric annealing furnace equipped with a temperature recorder and programme controller. The test bars were packed in ore of strength 6 parts of old to 1 of new, with a 2:1 ore to metal ratio. The annealing cycle employed to give the results reported in this Paper consisted of a 12-hour heating period to 1,000 deg. C., 100 hours at 1,000 deg. C. and a 36-hour cooling period down to 600 deg. C.

The tensile bars, two bars for each composition, were tested to determine the yield strength, tensile strength and elongation value. The one bend bar of each composition was broken in a standard bend test machine and the angle of bend determined. The 0.875 in. bars provided specimens for metallographic examination. The mechanical test results are given in Table I. The yield, tensile and elongation values are an average of two results.

The value obtained by dividing the actual sulphur content by the actual manganese content is given for each composition in the last column of Table I. When the sulphur-manganese value of 0.58 is exceeded, then theoretically the sulphur content is in excess of the manganese content, while with a value below 0.58, all the sulphur content would be expected to be chemically neutralised by the manganese content. This follows from the formula; to indicate the amount of manganese required to neutralise all the sulphur as manganese sulphide, the reaction $FeS + Mn = MnS + Fe$ is not considered as reversible. The relationship between the sulphur/manganese value and tensile strength, yield strength and elongation has been plotted graphically to assist in its interpretation. The graphs obtained for each of the 18 melts are shown in Fig. 2. The broken line dividing these graphs at the sulphur/manganese value of 0.58 represents the point where the sulphur content is the chemical equivalent of the manganese. As this line is approached from the left hand side of each graph, with increasing sulphur content, the amount of excess manganese decreases. Beyond and to the right of this line, increasing sulphur gives an increasing excess of unneutralised sulphur, and an increasing amount of iron sulphide. Discussion of the trends indicated by these graphs is deferred until the results of the metallographic examination have been described.

Metallographic Examination of Annealed Test-bars

A complete cross-sectional microspecimen was cut from each annealed 0.875 in. bar, giving a total of 90 specimens, one of each composition studied. Each specimen was examined to determine the nature of the matrix, the size, form and distribution of the

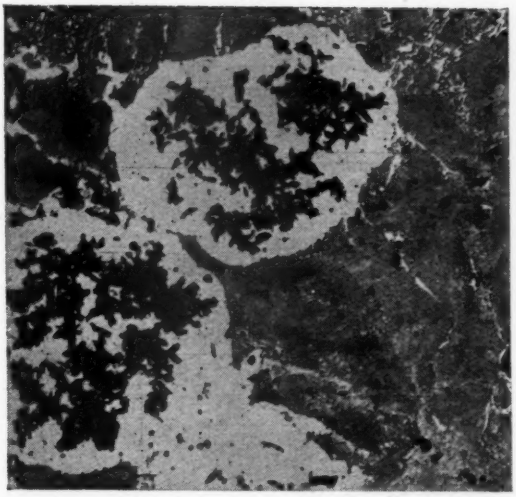

FIG. 9.—BAR NO. 11B. MANGANESE 0.34 PER CENT.; SULPHUR 0.118 PER CENT.
MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

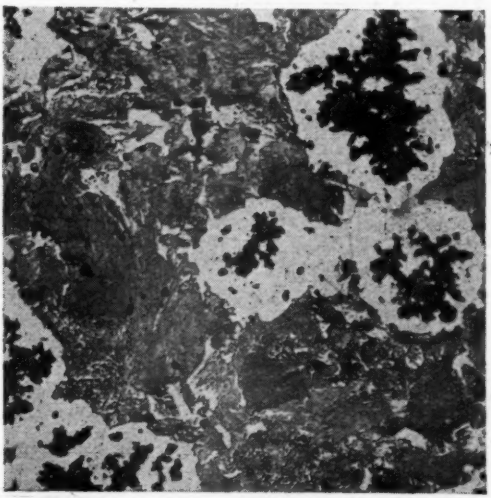

FIG. 10.—BAR NO. 11C. MANGANESE 0.34 PER CENT.; SULPHUR 0.206 PER CENT.
MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

Annealability of White Iron

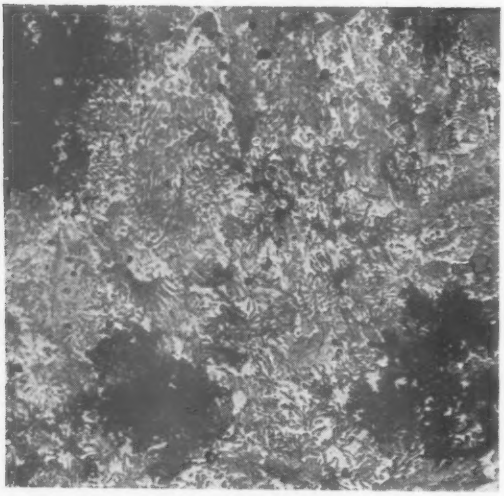

FIG. 11.—BAR NO. 11D. MANGANESE 0.34 PER CENT.; SULPHUR 0.282 PER CENT. MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

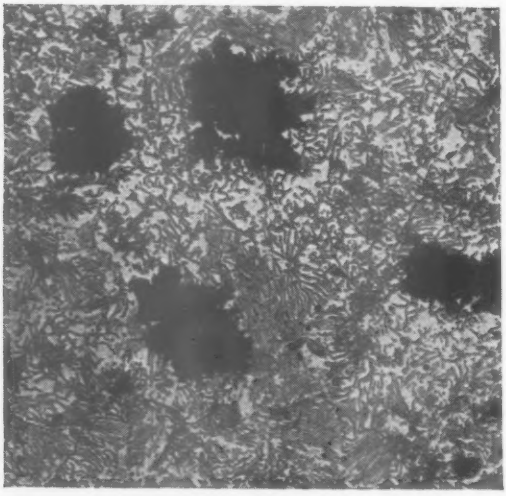

FIG. 12.—BAR NO. 11E. MANGANESE 0.34 PER CENT.; SULPHUR 0.340 PER CENT. MAGNIFICATION × 120. ETCHED IN 4 PER CENT. PICRAL.

temper carbon, and the occurrence of eutectic cementite or eutectic graphite. Space does not permit a full report on this metallographic examination to be included here, and only the main points of interest are included in the following, these points being illustrated in the series of photomicrographs shown in Figs. 3 to 17.

It was generally observed that in specimens containing a large excess of manganese over sulphur according to their chemical equivalents, little or no ferrite occurred associated with the temper carbon, and there was a tendency for eutectic cementite to persist (see Fig. 13). An increasing sulphur content, progressively reducing the excess of manganese, led to the occurrence of a progressive increase in the amount of ferrite associated with the temper carbon (see Figs. 14, 15 and 16, and to a lesser degree in Figs. 8, 9 and 10). The maximum amount of ferrite associated with temper carbon was contained in specimens which had their manganese content almost neutralised by the sulphur content. As soon as the sulphur had been increased sufficiently to absorb all the manganese, and to give a small excess of sulphur, a marked change in the structure of the matrix was then observed. Ferrite no longer occurred associated with the temper carbon and the pearlite became more coarsely lamellar or divorced. This is illustrated in Figs. 4, 11 and 17. A further increase in sulphur content tended to increase the amount of divorced pearlite in the matrix (see Figs. 4 to 7 and 11 and 12), and also the amount of hypereutectoid cementite which is normally associated with the divorced pearlite.

It is clearly shown in Figs. 3 to 7 and 9 to 12, that an increasing sulphur content induced a marked decrease in temper carbon aggregate or nodule size. In Bars Nos. 2A and 11A, as illustrated in Figs. 3 and 8 respectively, the temper carbon occurred in the aggregate form, and increasing sulphur contents progressively reduced the size of these aggregates and made them compact in Bars 2E and 11E, as shown in Figs. 7 and 12.

It was apparent from the metallographic examination that eutectic graphite was most likely to occur when the manganese content was chemically equivalent to or slightly in excess of the sulphur content. In materials having this small manganese excess, there was an indication that increasing silicon content progressively increased the tendency for eutectic graphite to occur. There was a tendency for a small amount of eutectic cementite to remain in those melts having a low silicon content, and especially in those having a low silicon content in conjunction with a large excess of manganese content. Low silicon material having a large excess sulphur content also had this tendency.

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1 "The Influence of Raw Material on the Properties of Whiteheart Malleable Cast Iron with Special Reference to the Influence of Residual Elements," 1946, Institute of British Foundrymen, Advance Paper 849, 12 pp.

2 Morrogh, H., Journal of the Iron and Steel Institute, 1941, vol. 143, pp. 207-253.

3 Herty, C. H., and True, O. S., American Institute of Mining and Metallurgical Engineers, 1925, vol. 71, p. 540.

4 Norbury, A. L., Proceedings of the Institute of British Foundrymen, 1928-1929, vol. 22, pp. 151-176.

(To be continued)

Control of Engagement and Direction of Labour

Placing Workers in Essential Jobs

As part of the Governmental action which is being taken to meet the present critical economic situation of the country, the President of the Board of Trade announced on September 12 the Government's plans regarding the new export drive and the direction, if necessary, of the activities of employers by means of the allocation of fuel and power, the control of materials, components and manufactured parts required in the make-up of exported goods, the requirement of increased export quotas, and the diversion of exports to hard-currency countries.

As a counterpart, the Minister of Labour and National Service has made an Order for the Control of Engagement. The object of the Order is to enable men and women seeking employment to be diverted to jobs on essential work. This is effected by requiring employers to obtain their labour and workers to obtain their employment through a local office of the Ministry of Labour or an approved employment agency. Workers will be given as wide a choice as possible of available jobs on essential work, and directions will be issued only if they insist on taking unessential work or refuse to take any work at all.

The Control of Engagement Order, 1947, was made on September 18. under Regulation 58A of the Defence (General) Regulations, 1939, and comes into force on Monday, October 6. It will expire at the end of 1948. With certain exceptions, all men aged 18 to 50 inclusive, and women aged 18 to 40, inclusive, are covered by the Order.

An employer may not engage or even seek to engage (*e.g.*, by advertisement, poster, or circular letter) any worker to whom the restrictions apply, otherwise than through a local office of the Ministry of Labour and National Service or an employment agency approved for the purpose. Similarly, workers must obtain their employment through a local office of the Ministry or approved employment agency.

Advertisements and notices of vacancies are allowed if they clearly state that they invite applications only from excepted persons, *e.g.*, boys and girls under 18, women of 41 and over, or men of 51 and over. Newspaper advertisements may be published in a column bearing a cautionary heading, restricting the vacancies to persons or employments excepted from the provisions of the Order.

Exemption certificates may be issued by local offices to employers permitting them to advertise for, and engage, workers direct. Such certificates would be subject to conditions, *e.g.*, restricting the employers as to the number and type of workers who may be engaged or advertised for. Permits may be issued to workers covered by the Order where the local office considers that they can better get work by their own efforts.

Excepted Persons and Employments

Certain persons are free to be engaged for employment without reference to a local office of the Ministry or approved employment agency; in particular:—

(i) Persons outside the age limits; (ii) women with children of their own under 15 living with them; (iii) members of H.M. Forces and Women's Services during the period of their paid resettlement leave.

Certain employments can also be taken without reference to a local office of the Ministry or approved employment agency; in particular:—

(*a*) Part-time employment for not more than 30 hours weekly, whether with one or more employers; (*b*) employment in a managerial, professional, administrative or executive capacity.

Persons normally employed in coal mining can move freely between jobs in coal mining, but cannot be engaged for any employment outside coal mining except through a local office of the Ministry or approved employment agency. Persons outside the industry may be freely engaged for either agriculture or coal mining.

More detailed information about the Order will be contained in a leaflet, copies of which will shortly be available on application to the Ministry of Labour and National Service (L.S.28), 15, Portman Square, London, W.1.

Limited Direction of Labour

The following general rules will govern the use of the power of direction to employment, which is contained in Defence Regulation 58A(1):—

(*a*) Workers will be given as wide a choice as possible among available jobs on essential work. In the last resort if he or she, having been given full opportunity and a reasonable range of selection, still insists on taking unessential work or refuses to take any work at all, a direction may be issued to take the most important suitable employment available.

(*b*) Single men and single women without family responsibilities will, as far as possible, be offered employment on essential work within daily travelling distance; but if no vacancies exist on such work within daily travelling distance, they will be offered jobs on essential work in other districts, provided suitable accommodation is available. In the last resort, directions to such work may be issued. Women under 20 years of age, however, will not be directed away from home.

(*c*) Men with family responsibilities will not in general be directed to take employment which would require their living away from home. In special cases, however, they may be so directed, in which case they would be entitled to living-away-from-home allowances under the conditions of the existing schemes. Women with family responsibilities will not be directed away from home.

(*d*) Every effort will be made to place the worker on essential work in his or her normal occupation. After a period of 14 days, however, if the worker still remains unemployed, he or she will be offered suitable employment in some other occupation on essential work.

The interests of directed persons are safeguarded, and will continue under the new arrangements to be safeguarded, by the existing Control of Employment (Directed Persons) Order, 1943. This Order provides that—

(1) the employer may not dismiss a directed person (except for serious misconduct) while the direction is in force;

(2) the directed person or his employer may apply to a National Service Officer for the direction to be withdrawn so that the employment may be terminated;

(3) where a directed person applies for the withdrawal of a direction on the ground that he is stood off by his employer from his work without wages, the National Service Officer, if he is satisfied that this is the case, must withdraw the direction provided that the application is made within seven days;

(4) the directed person or his employer may appeal to the Local Appeal Board against the decision of a National Service Officer to withdraw or to refuse to withdraw the direction;

(5) the directed person may appeal to the Local Appeal Board against dismissal for serious misconduct.

World Engineering Conference

The Council of the World Engineering Conference met in Zürich last month, when representatives were present from the following 25 nations:—Austria, Belgium, Brazil, Bulgaria, Czechoslovakia, Denmark, Egypt, Finland, France, Great Britain, Holland, Hungary, India, Iran, Italy, Luxemburg, Norway, Palestine, Philippines, Poland, Rumania, Sweden, Switzerland, the U.S.A., and Yugoslavia. Dr. Malina represented UNESCO. The World Engineering Conference is concerned with the development of technology within its social context, and the part which engineers and technicians can play in reducing the physical effort of man and improving the world standard of living. Britain was represented by Lord Sempill, president, and Mr. G. Hall, secretary of the Institute of the Motor Industry, and Mr. W. R. Howard, Mr. F. Parfett and Mr. R. Lowe, chairman, hon. secretary and organising sec. respectively of the British Committee, while the U.S.A. delegate was General Reimel of the Engineers' Joint Council of the U.S.A. The conference was particularly concerned with the part to be played by engineers and technicians in the development of UNESCO. The Council resolved to set up a permanent committee for the study of the effects of technological development on social and international relations, and decided on the immediate establishment of a committee to study power production. The next World Technical Congress is to be held in Cairo in March, 1949.

STOCKTON-ON-TEES CORPORATION has accepted the tender of West's Gas Improvement Company, Limited, Manchester, at £299,000, for the supply, delivery and erection of a complete installation of vertical retorts with gross initial capacity of at least 2,000,000 cub. ft. of gas daily, at the Corporation gasworks.

Personal

MR. G. R. FISHER has been appointed a director of the Zinc Corporation, Limited.

SIR RONALD MARK CUNLIFFE TURNER has been appointed a director of the Rio Tinto Company, Limited.

MR. E. A. PHILLIPS, managing director of Harper, Phillips & Company, Limited, Albion Foundry, Eastgate, Grimsby, has been elected president of the Lincoln section of the Institute of British Foundrymen.

MR. HENRY MAIN, managing director of the Caledon Shipbuilding & Engineering Company, Limited, Dundee, left this country last week by air. He has been invited by the Government of Northern Rhodesia to sit on a commission investigating the advancement of the African native in industry.

MR. ROBERT C. STANLEY has been awarded by the King his Majesty's Medal for Services in the Cause of Freedom, in recognition of his valuable services to the Allies. Mr. Stanley is chairman and president of the International Nickel Company of Canada, Limited, and, in over 40 years of service, has played a major part in the development of this important Canadian industry. He has been president of the company since 1922 and, in addition, chairman since 1937. Besides his valuable work in the industrial sphere, Mr. Stanley was an active member of the British War Relief Society in America during the war, for which he collected over a quarter of a million dollars. Mr. Stanley left last Friday for New York, on the completion of his first post-war visit to this country. He has spent six weeks studying conditions here, his visit being primarily concerned with the activities of the Mond Nickel Company in this country.

DR. H. G. TAYLOR has been appointed director of the British Welding Research Association in place of Mr. A. Ramsay Moon. Dr. Taylor was educated at Plymouth and Devonport Technical College, Barrow-in-Furness Technical School, Battersea Polytechnic and the City of Guilds (Engineering) College. In 1921, he joined Vickers, Limited, of Barrow-in-Furness, and, after three years, obtained the firm's scholarship to the University of London, where he graduated with first-class honours in electrical engineering, subsequently attaining the M.Sc.(Eng.) degree for a thesis on the collection of current from commutators and slip-rings. Dr. Taylor then joined the Metropolitan-Vickers Electrical Company, Limited, and, in 1929, went to the Electrical Research Association to commence investigations on the subject of earthing, for which work he was awarded the D.Sc.(Eng.). In 1937 he was appointed electrical engineer to the Copper Development Association, then went as technical adviser to Philips Industrial (Philips Lamps), Limited, and manager of the industrial development department of Philips Lamps, Limited, in which positions he has been, for the last five years, closely connected with arc and resistance welding. He hopes to take up his new appointment by the beginning of November.

Imports and Exports of Iron and Steel

Board of Trade Returns for August

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in August and the first eight months of 1947. Figures for the corresponding period of 1938 are given for purposes of comparison.

Total Exports of Iron and Steel.

Destination.	August, 1947.	Eight months ended August.	Two-thirds of 1938.
	Tons.	Tons.	Tons.
Eire	4,597	42,910	37,146
Channel Islands	553	4,578	4,944
Malta and Gozo	97	2,126	1,536
Cyprus	146	1,883	1,104
Palestine	1,942	28,245	5,380
British West Africa	3,019	31,342	33,162
Union of South Africa	14,164	109,787	154,058
Northern Rhodesia	1,188	6,023	13,716
Southern Rhodesia	1,035	12,593	24,142
British East Africa	3,597	27,047	17,288
British India	6,304	65,414	105,784
Burma	4,269	30,818	12,342
British Malaya	3,214	26,352	44,390
Ceylon	881	8,408	17,354
Hong Kong	1,152	14,537	15,730
Australia	4,186	26,494	113,936
New Zealand	3,403	31,683	87,922
Canada	1,370	10,639	56,940
British West India Islands	1,396	22,548	29,500
Anglo-Egyptian Sudan	1,410	8,441	5,526
Other British countries	5,049	30,453	11,970
Soviet Union	887	2,502	2,900
Finland	3,804	31,490	11,738
Sweden	6,034	64,593	7,983
Norway	4,293	35,564	13,516
Iceland	1,110	5,355	438
Denmark	5,887	68,397	58,170
Poland	52	598	1,658
Netherlands	7,494	67,181	34,372
Belgium	1,249	14,446	13,550
Luxemburg	3	602	69
France	847	14,815	8,924
Switzerland	1,293	11,411	1,855
Portugal	1,093	11,166	5,142
Spain	446	3,704	5,176
Italy	18	4,872	3,426
Greece	240	12,264	1,168
Turkey	138	8,902	9,172
Dutch East Indies	884	15,517	18,204
Dutch West India Islands	177	7,068	1,642
Belgian Congo	116	1,286	203
Portuguese East Africa	688	3,562	9,480
Syria	159	2,401	1,737
Egypt	4,754	32,090	22,940
Iraq	4,336	45,919	17,160
Iran	4,624	39,193	73,586
China	8,895	41,852	15,006
U.S.A.	929	8,520	1,458
Colombia	395	5,801	2,549
Venezuela	1,803	20,878	3,116
Ecuador	109	3,601	1,062
Peru	453	3,120	2,021
Chile	383	6,740	4,196
Brazil	2,225	18,900	11,326
Uruguay	800	7,453	5,058
Argentine	7,552	56,838	52,904
Other foreign countries	4,961	37,788	60,473
Total	142,103	1,258,710	1,277,250

AN AMERICAN manufacturing company has purchased Kilronan Castle, Co. Roscommon, from the Eire Forestry Department for the purpose of manufacturing kitchen ranges, fireplaces and other metal requisites.

Total Imports of Iron and Steel.

From	August, 1947.	Eight months ended August.	Two-thirds of 1938.
	Tons.	Tons.	Tons.
British India	750	1,679	103,756
Australia	5,331	43,034	24
Canada	11,827	106,114	78,250
Other British countries	53	1,376	3,732
Sweden	652	7,305	59,864
Norway	1,868	17,768	22,516
Belgium	6,069	27,617	182,454
Luxemburg	470	4,706	39,068
France	21	1,073	171,564
U.S.A.	6,446	147,089	133,794
Other foreign countries	2,772	9,632	101,160
Total	36,259	367,393	896,180
Iron ore and concentrates—			
Manganiferous	8,680	52,939	41,522
Other sorts	712,508	4,484,825	3,401,246
Iron and steel, scrap and waste, fit only for the recovery of metal	10,186	247,110	421,468

Exports of Iron and Steel by Products.

Product.	August, 1947.	Eight months ended August.	Two-thirds of 1938.
	Tons.	Tons.	Tons.
Pig-iron	3,169	39,694	62,628
Ferro-alloys, etc.—			
Ferro-tungsten	126	624	344
Spiegeleisen and ferro-manganese	294	7,956	3,464
All other descriptions*	46	453	698
Ingots, blooms, billets and slabs	79	3,078	6,496
Iron bars and rods	280	4,103	2,132
Sheet and tinplate bars	—	44	8,254
Wire rods	732	2,393	2,120
Bright steel bars	1,507	17,780	4,392
Other steel bars and rods	8,506	96,616	68,000
Special steel	1,398	11,511	3,288
Angles, shapes and sections	6,738	67,877	44,583
Castings and forgings	366	3,836	1,078
Girders, beams, joists and pillars	1,160	20,066	22,314
Hoop and strip	2,561	26,643	24,918
Plates, ¼ in. thick and over	8,826	95,221	87,306
Black plates	4,485	24,297	9,692
Black sheets	1,660	30,365	42,340
Galvanised sheets	6,425	40,017	97,956
Tinplates	11,345	94,159	212,872
Tinned sheets	2,353	4,945	940
Terneplates	57	429	2,884
Decorated tinplates	—	655	2,912
Cast-iron pipes, up to 6-in. dia.	4,360	36,477	32,618
Do., over 6-in. dia.	2,246	25,381	28,642
Wrought-iron tubes	17,499	161,965	146,648
Radiators and central-heating boilers	267	2,692	2,685
Railway material	11,150	104,873	105,436
Wire	3,352	34,106	36,788
Cable and rope	2,333	18,514	10,934
Netting, fencing and mesh	1,377	11,065	6,278
Other wire manufactures	593	4,956	2,448
Nails, tacks, etc.	509	5,211	2,538
Rivets and washers	716	5,203	5,690
Wood screws	424	2,950	1,674
Bolts, nuts and metal screws	1,737	15,014	11,716
Stoves, grates, etc. (excl. gas)	431	4,052	4,670
Sanitary cisterns	59	535	1,874
Fencing material	491	5,051	3,420
Anchors, etc.	776	5,986	4,224
Chains	759	5,870	4,194
Springs	368	3,928	2,620
Hollow-ware	6,058	41,765	7,136
All other manufactures	24,485	170,354	143,404
Total	142,103	1,258,710	1,277,250

* The figures for 1938 are not completely comparable with those for subsequent years.

News in Brief

SUNDERLAND TOWN COUNCIL has decided to ask the Board of Trade to acquire compulsorily the site of the Shipbuilding Corporation yard at Southwick, Sunderland, with a view to its utilisation as works for a London firm of oil-engine manufacturers.

CRITTALL MANUFACTURING COMPANY, LIMITED, and Luxfer, Limited, have jointly formed a new company to take over the aluminium-window sections of their respective businesses. The new company is Crittall-Luxfer Aluminium Windows, Limited, and has a capital of £125,000 in £1 shares.

MISS J. U. SPELLMAN has been appointed librarian to the Copper Development Association, Kendals Hall, Radlett, Herts. The Association's library has been expanding at a considerable rate for many years and now comprises a most valuable collection of technical information on copper and its applications.

THE NEW EIRE GOVERNMENT-SPONSORED company which has acquired the Haulbowline steelworks at Cork Harbour, expects to begin producing steel bars, rods and angles immediately. The works have been overhauled, and the supply of coal and scrap steel accumulated is sufficient to maintain production for several months.

MR. G. O. WILLEY, M.P. for Cleveland, speaking at Grangetown, said that the target set for the steel industry for the next 12 months was the highest that the industry had ever been asked to reach. It was 14 million tons of steel. Steelmakers had told him that they believed this could be achieved if there was a non-stop flow of coal to the industry.

IN BRAZIL, ARMCO INDUSTRIAL E COMERCIAL S.A., a subsidiary of the American Rolling Mill Company, expects to complete this year the construction of its Rio de Janeiro works to manufacture steel tubes and other equipment for hydro-power installations. The company intends to erect a factory in Porto Alegre for the production of railway materials.

AN IMMEDIATE REDUCTION of production costs is imperative if our export drive is to be successful, states the Engineering Industries Association in a memorandum on Sir Stafford Cripps's export proposals. Otherwise, the utterly unsound economic device of Government-subsidised exports may have to be used so that our potential customers can afford our goods.

THE MINISTRY OF TOWN AND COUNTRY PLANNING has held an inquiry into an appeal by Fred Newman & Company, Limited, ironfounders, of Lever Street, Wolverhampton, against the Wolverhampton Corporation's refusal of permission to rebuild their existing foundry. Mr. R. A. Youll, who conducted the inquiry, visited the site and will report to the Ministry.

AT A MEETING at Middlesbrough, the Tees-side Industrial Development Board considered delays in building new factories in the area, and it was decided to appoint a committee to ascertain the true position concerning building operations. The chairman (Mr. R. R. Kitching), a Middlesbrough architect, said that although factories were allocated to areas by the Board of Trade, the labour supply was left to local arrangement. What the Tees wanted was priority in the allocation of bricklayers.

PLANS FOR increasing production of high-grade steel in Austria are being considered. Much of the industry is centred on Styria in the British Zone of Austria, and it is proposed to link-up the Alpine Montan, Boehler, Styria and Schoeller-Bleckmann concerns. To avoid unnecessary duplication of work certain plant and machinery will be interchanged. Another project under consideration for the purpose of more economic working is the removal of the Linz foundries to Donawitz; but no decision has yet been taken.

A NEW COMPANY, Summersons Foundries, Limited, has been formed by Thomas Summerson & Sons, Limited, to control their works at Darlington. The parent firm will continue to manage the railway engineering and contracting plant, including the new factory built on the Spennymoor trading estate. It was announced last year that, owing to lack of accommodation, the railway engineering plant at Darlington, comprising 50 per cent. of Thomas Summerson & Sons' business, would be transferred to the new Spennymoor factory.

THE IRON AND STEEL TRADES CONFEDERATION has expelled about 300 members employed at the Consett Iron Company, Limited, Co. Durham, from the Union for refusing to obey the agreement for a continuous working week. The expulsion will operate from October 25. All those expelled were members of the Consett No. 1 branch of the Confederation. The Confederation also has expelled 1,500 Sheffield and district steel-melting shop workers. In this case, too, the notices, which take effect on October 25, follow the men's refusal to accept the continuous working week.

THE NATIONAL RESEARCH CORPORATION, of Cambridge, Mass., U.S.A., have just announced the formation of British American Research, Limited, which has recently been incorporated in Scotland as a joint venture with Daniel Varney, Limited. The latter, controlled by Sir James Lithgow, has been engaged in the manufacture of scientific research instruments and laboratory apparatus. British American Research, Limited, will undertake the manufacture and sale of industrial high-vacuum equipment, as used in high-vacuum evaporation, distillation, dehydration and certain branches of metallurgy.

HOLDERS of the 247,955 ordinary £1 shares of John Baker & Bessemer, Limited, are to receive a payment equivalent to 10s. a share-out of a capital profit arising from the appreciation of an investment. An interest acquired in 1941 in the Sheffield firm of Woodhouse & Rixson, Limited, and since carried in the balance-sheet at the original cost of £42,498, has now been valued at four times that figure, producing a surplus of £127,494. The directors are distributing the bulk of this to ordinary shareholders in the form of one 2s. 6d. ordinary stock unit in the Woodhouse company for each share held, so that shareholders will then possess nearly three-quarters of the investment.

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Obituary

MR. JOHN EDWIN MOTTERSHAW, representative of Camm, Bagshaw & Company, Limited, steel manufacturers, of Sheffield, died recently at the age of 85.

MR. J. P. GARNER, of Sheffield, managing director of Howell & Company, Limited, steel and tube manufacturers, Wincobank, died on September 21. Mr. Garner joined the firm as a junior clerk 47 years ago.

MR. JAMES MITCHELL, chairman of the Grahamston Iron Company, Limited, Falkirk, has died at the age of 73. He was a director of the company—founded by his father in 1808—from 1914 to 1926, when he was appointed chairman on the death of his brother-in-law, Mr. Thomas Downie. With his two younger brothers he carried on the business. Mr. Mitchell was a member of the executive committee of the National Light Castings Ironfounders' Federation.

LT.-COL. SIR HENRY KENYON STEPHENSON, of Bakewell, died on September 20, aged 82. Born in Sheffield in 1865, Sir Henry began his business career in 1883 at Stephenson, Blake & Company, Limited, type founders, of which his father was the head, and became a partner in 1888 and later chairman. In 1919 he was Master Cutler, and was one of the few men who have been both Master Cutler and Lord Mayor of Sheffield. At the same time Sir Henry was also an M.P. In addition to his chairmanship of Stephenson, Blake & Company, Limited, Sir Henry was also chairman of Sheffield and District Gas Company, Thomas Turton & Sons, Limited, and chairman of Sheepbridge Coal & Iron Company, Limited, from 1943 to 1946. He was also associated with Dinnington Main Coal Company, Limited. Sir Henry was made a Freeman of the City of Sheffield in 1929.

Increase in Steel Prices

An increase of 5 to 6 per cent. in steel prices has been announced by the Ministry of Supply. Unfortunately, the information was received as the FOUNDRY TRADE JOURNAL was on the point of going to press and, consequently, it was not possible to bring the price list on page 16 up to date.

The reason for the rise is the increases that have taken place in freight rates and the cost of coal and coke, and over 100 alterations have been made in the schedule of prices. The increases are effective as from yesterday (Wednesday).

The increases, per ton, in pig-iron prices are as follow:—Hematite (basis prices), from 11s. to 16s. 6d., according to zone; foundry and forge iron, 18s.; low-phosphorus foundry iron, from 11s. to 16s. 6d., according to zone; Staffordshire blast-furnace low-phosphorus foundry iron, 14s. 6d.; Scotch foundry iron, 13s. 6d.; cylinder and refined iron, 13s. 6d.; refined malleable, 13s. 6d.; cold-blast, 18s. 3d.; blast-furnace ferro-manganese, 17s.; spiegeleisen, 15s.

Other alterations include steel billets, increased by 15s. a ton; heavy steel products by 18s. 6d. a ton; rerolled steel products by 21s. a ton, and steel sheets by 23s. 6d. a ton.

Prices of Chrome Ore and Concentrates Increased

The following selling prices for chrome ore, which include carriage charges to nearest rail point to consumers' works, apply as from October 1. The prices are an increase of 2s. per ton ex-ship and 4s. per ton ex-store, with the exception of the prices of the Turkish ores, which are new importations into Britain.

Refractory Grades.—Rhodesian Imperial grade, £9 14s. 6d. per ton ex-ship, £10 14s. per ton ex-store; Transvaal first grade, £7 19s. 6d. and £8 19s.; Sierra Leone, £9 12s. and £10 11s. 6d.; Philippine, £8 12s. and £9 11s. 6d.; Indian, £9 4s. 6d. and £10 4s.; Turkish "A" grade, £9 14s. 6d. and £10 14s.; Turkish (Grade 1), £9 18s. 6d. and £10 18s.

Metallurgical Grades.—Rhodesian washed concentrates £9 17s. ex-ship and £10 16s. 6d. ex-store; Rhodesian lumpy metallurgical, £9 17s. and £10 16s. 6d.; Baluchistan, £10 2s. and £11 1s. 6d.

Steel Company of Wales

The board of the Steel Company of Wales, Limited, have appointed the following directors to executive positions:—Mr. E. J. Pode, managing director; Captain H. L. Davies, assistant managing director; Mr. W. F. Cartwright, general manager, steel division; Mr. T. O. Lewis, general manager, tinplate division.

It is also announced that the undertaking at Orbe works, Newport, will be carried on as a wholly-owned subsidiary, to be named the Steel Company of Wales (Lysaght Works), Limited. The board of this company will be:—Sir Charles Bruce Gardner, chairman; Mr. E. C. Lysaght, Mr. E. J. Pode, Captain H. L. Davies, and Mr. R. P. Perry.

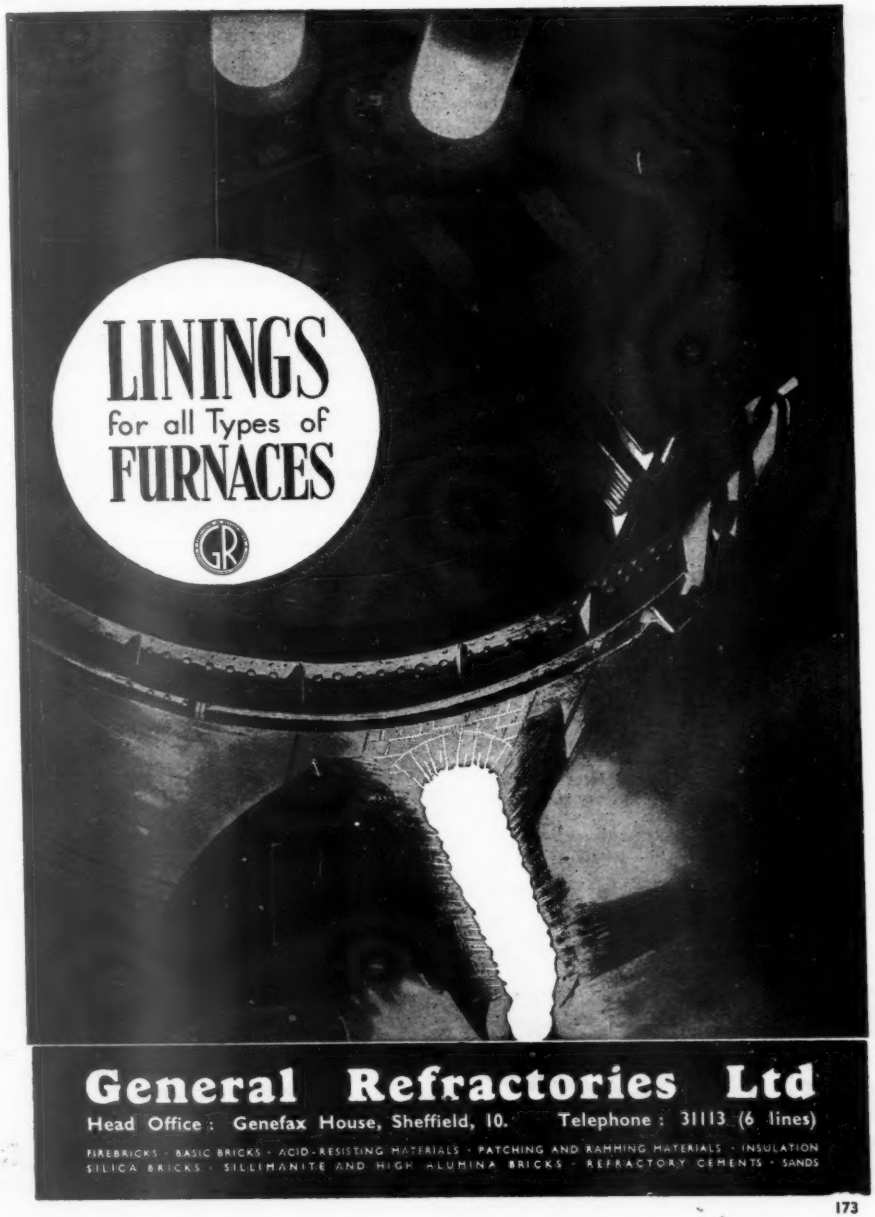
Zirconal, Limited

Zirconal, Limited, has been formed in conjunction with Silicon (Organic) Developments, Limited, 11, Cavendish Place, London, W.1, as a production unit for the manufacture of synthetic mullite and zircon refractory compounds, using the Silester bonding process. They are equipped to make semi-permanent moulds and dies, crucibles, furnace equipment, electrical and other components where thermal and electrical resistance, together with strength and refractoriness, are required.

Gazette

BRUSH MATERIALS MACHINERY COMPANY, LIMITED, is being wound up voluntarily. Mr. D. Morgan, 11, Argyll Street, London, W.1, is the liquidator.

THE PARTNERSHIP BETWEEN Leslie Frank Underwood, William Rayment Drake and Maurice Stuart Lane, carrying on business as welding engineers and electroplaters at 4, Tulip Place, Bermondsey, London, S.E.16, under the style of Plateandweld, has been dissolved by mutual consent, so far as concerns M. S. Lane, who retires from the firm.



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Raw Material Markets

Iron and Steel

Most foundries continue to receive the allocated tonnages of coke, but, shortly, the reduced winter quantities will be operating. Fortunately, consumers have been able to accumulate supplies and these will be of the utmost benefit later. The truck shortage is not now so pronounced as it was. Pig-iron supplies to foundries show no appreciable improvement, but further blast furnaces are coming into operation which may mean an expansion in the production of foundry numbers. Meantime every ton of basic pig-iron is required for the steelworks. The light foundry industry is not getting all the high-phosphorus pig-iron it requires, while expansion in this section is being retarded also through shortage of suitable scrap. Skilled labour is also difficult to recruit. The general engineering and speciality foundries are very active, much of their business being already in connection with machinery for P.M.L. priorities and export, particularly in the textile industries. These foundries have not been quite so short of pig-iron as in the case of the light industries. They are using considerable quantities of hematite, refined, low- and medium-phosphorus pig-iron, deliveries of which are reasonably good, although at the present time it is difficult to get additional tonnages of hematite. These foundries are short of both steel and cast-iron scrap.

Foundries generally are well supplied with ganister, limestone, etc., and in many cases consumers have taken the opportunity during the last few months to acquire stocks of these materials.

The re-rollers have exceptionally heavy bookings, particularly in the sheet section, which will cover their outputs for a long time to come. Unfortunately, production has not been at its maximum because of shortages of raw materials. It is understood that steel supplies will become more readily available for export contracts, but it is doubtful whether any heavier tonnages of plain joists, sections and plates will be increased for direct export. There is a very persistent demand for all forms of steel by users in this country, and large quantities of plates and sections are going to the shipbuilders and other big users.

Non-ferrous Metals

The copper and copper-alloy output figures for August, 1947, issued by the British Non-ferrous Metals Federation, give the total production as 47,319 tons, with a copper content of 38,929 tons. The consumption of virgin copper is shown as 26,300 tons and of copper and alloy scrap (copper content) 12,629 tons. Of the total production figure of 47,319 tons, output of unalloyed copper amounted to 23,111 tons and the remainder was comprised of alloyed copper (23,176 tons) and copper sulphate (1,032 tons), with a copper content of 15,560 and 258 tons, respectively. The price of copper sulphate has been reduced from £44 12s. 6d. to £42 10s. per ton, f.o.b., less 2 per cent. in 2-cwt. net bags for 98 to 100 per cent.

The tin market seems to be slightly easier; this is probably due to the report that Dutch sellers are reducing their prices. A parcel of Dutch tin is said to have been sold to Italy at about £442 10s. per ton, f.o.b. Rotterdam.

The zinc position seems to be fairly satisfactory, with supplies about adequate, but although there is no genuine shortage, in some cases, supplies occasionally reach a dangerously low level.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Die Cast Metals, Station Road, St. Helens, Lancs—£1,000. J. F. Gist and J. Gale.

Macdonald-Orton—Ironfounders, etc. £4,000. F. L. and L. H. Macdonald, and S. A. Orton.

Snowdon Engineering, 242, High Street, Bromley, Kent—£10,000. V. B. Snowdon and H. C. Westall.

Alpha Engineering (Coventry), 63a, Stoney Stanton Road, Coventry—£15,000. E. G. and D. H. Hurley.

Davies Abrasives, 247, High Street, Hounslow—£5,000. A. P., K. and L. D. F. Warren, and J. V. King.

Morley Brothers (Huddersfield), Folly Hall, Huddersfield—Sheet metal workers. £7,500. H. and L. M. Brook.

Grazebrook Cold Blast, Netherton Iron Works, Dudley—Pig-iron makers. £10,000. O. F. and C. J. Grazebrook.

Metalcraft Productions (Stirchley), 1558, Pershore Road, Stirchley, Birmingham—£2,500. V. George, D. F. and T. E. Davies.

ABOUT 250 FOUNDRY WORKERS at the Renfrew Works of Babcock & Wilcox, Limited, returned to work on September 25 after a one-day strike over a piecework wages dispute. Negotiations were then opened.

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